

Nov. 10, 1942.

C. M. YODER

2,301,236

APPARATUS FOR OPERATING ON SHEET MATERIAL

Filed July 21, 1939

7 Sheets-Sheet 1

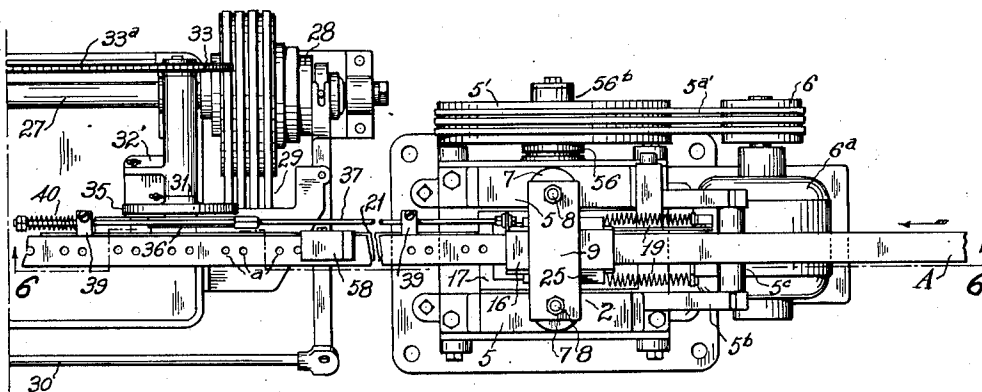


FIG. 1

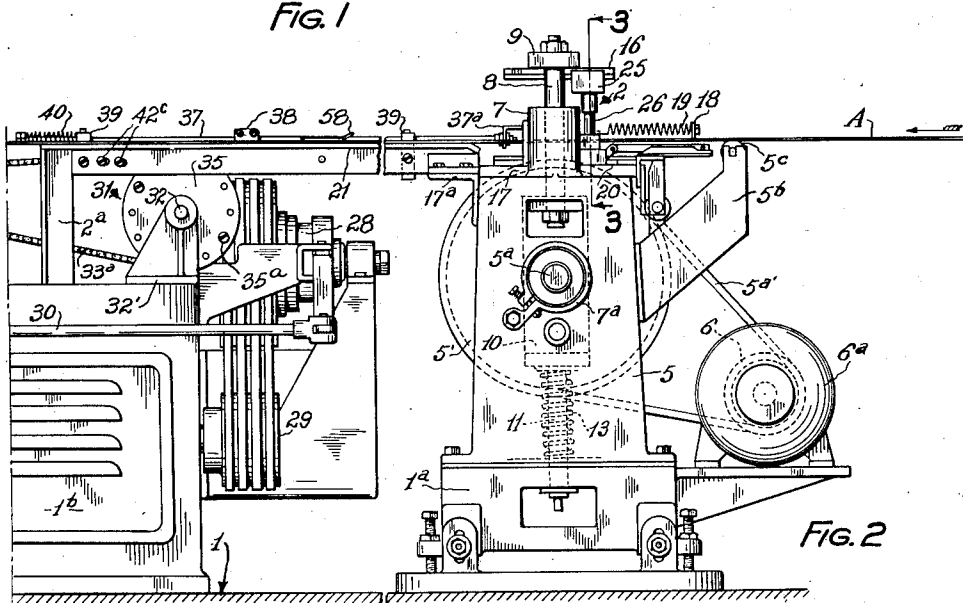
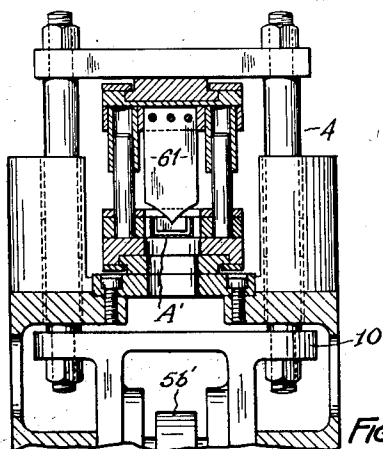


FIG. 2



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7 Sheets-Sheet 2

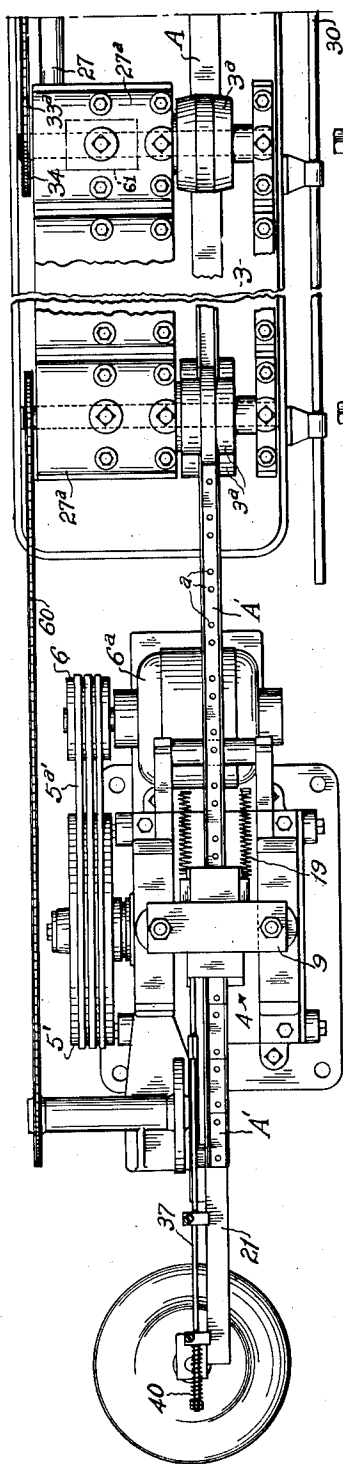


FIG. 1a

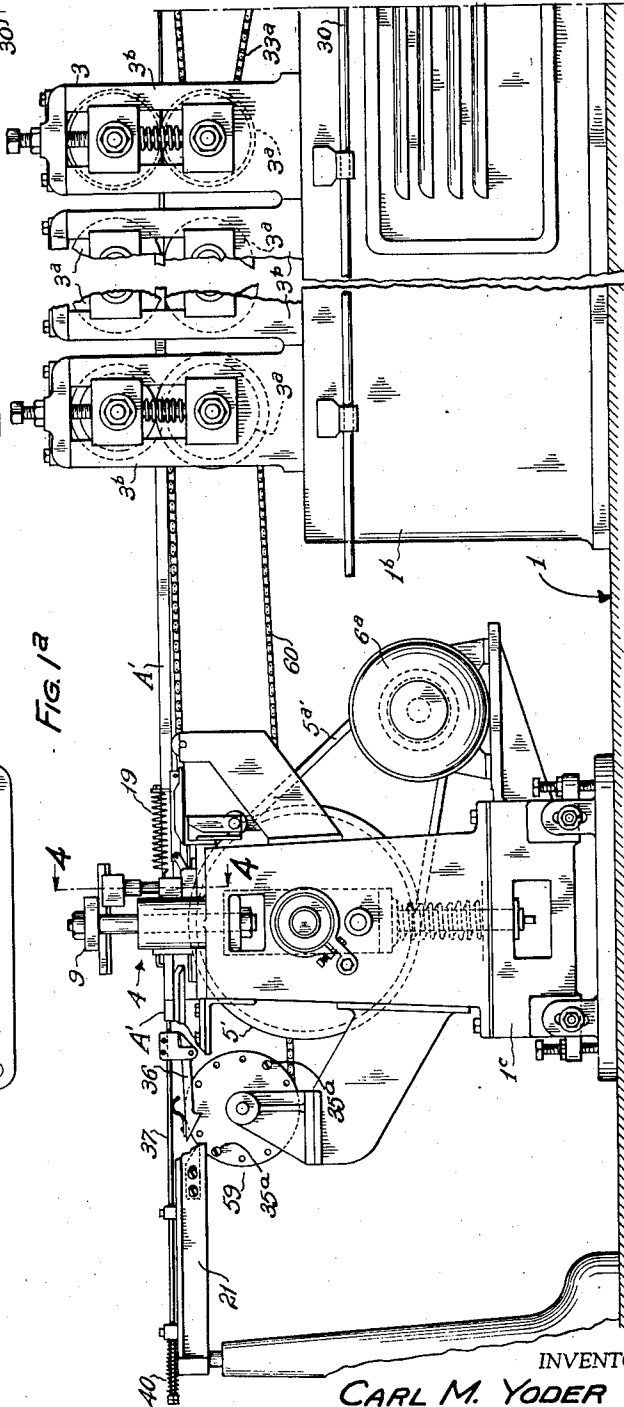


FIG. 2a

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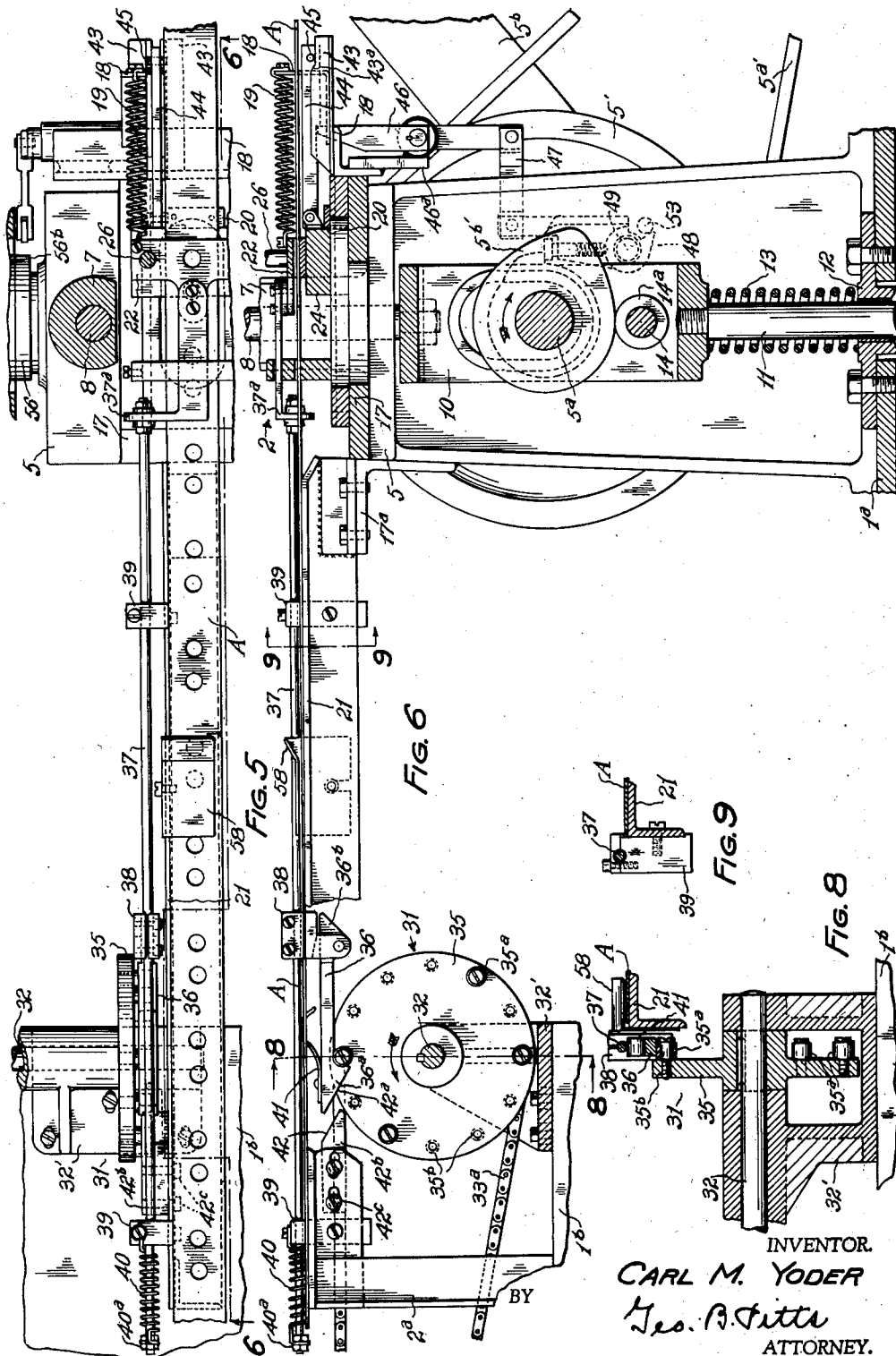
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7 Sheets-Sheet 3



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7 Sheets-Sheet 4

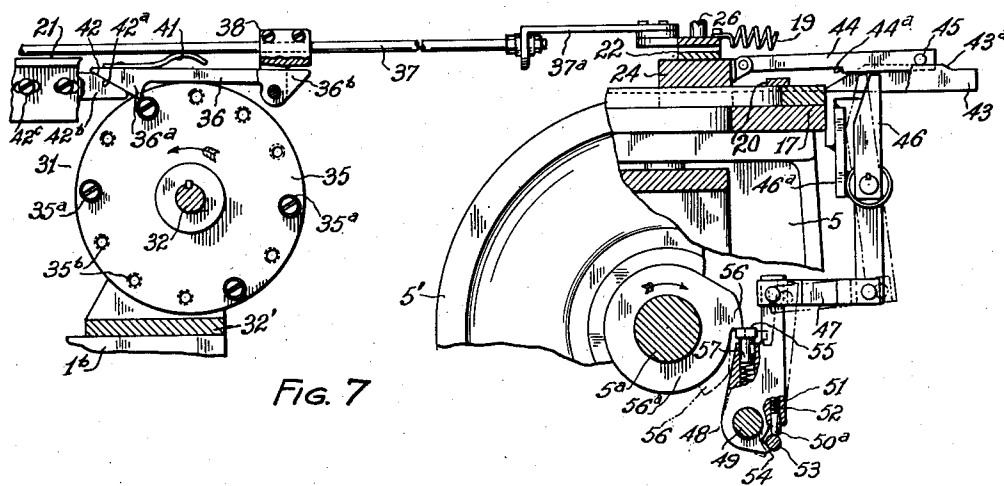


Fig. 7

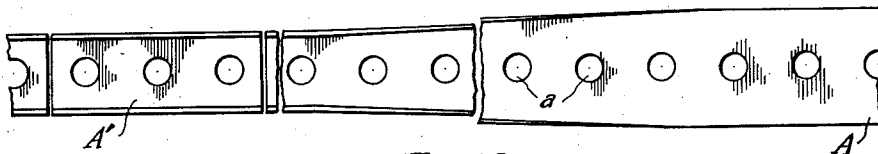


Fig. 10

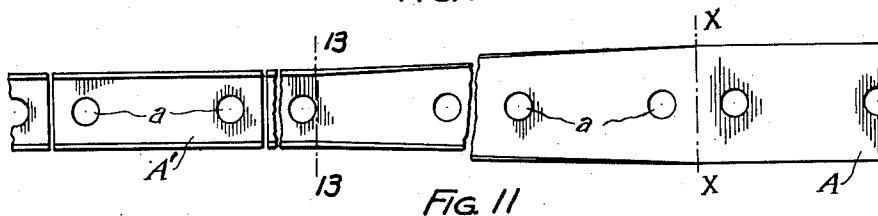


Fig. 11

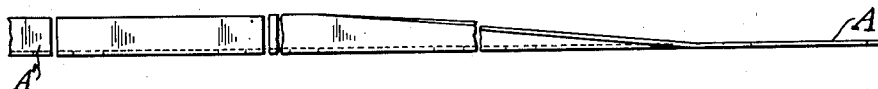


Fig. 12

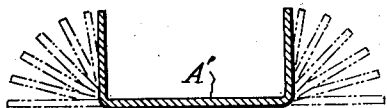


Fig. 13

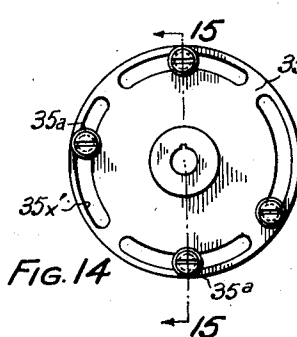


Fig. 14

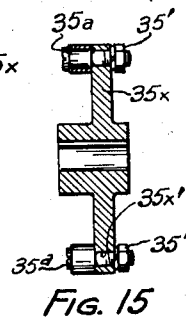


Fig. 15

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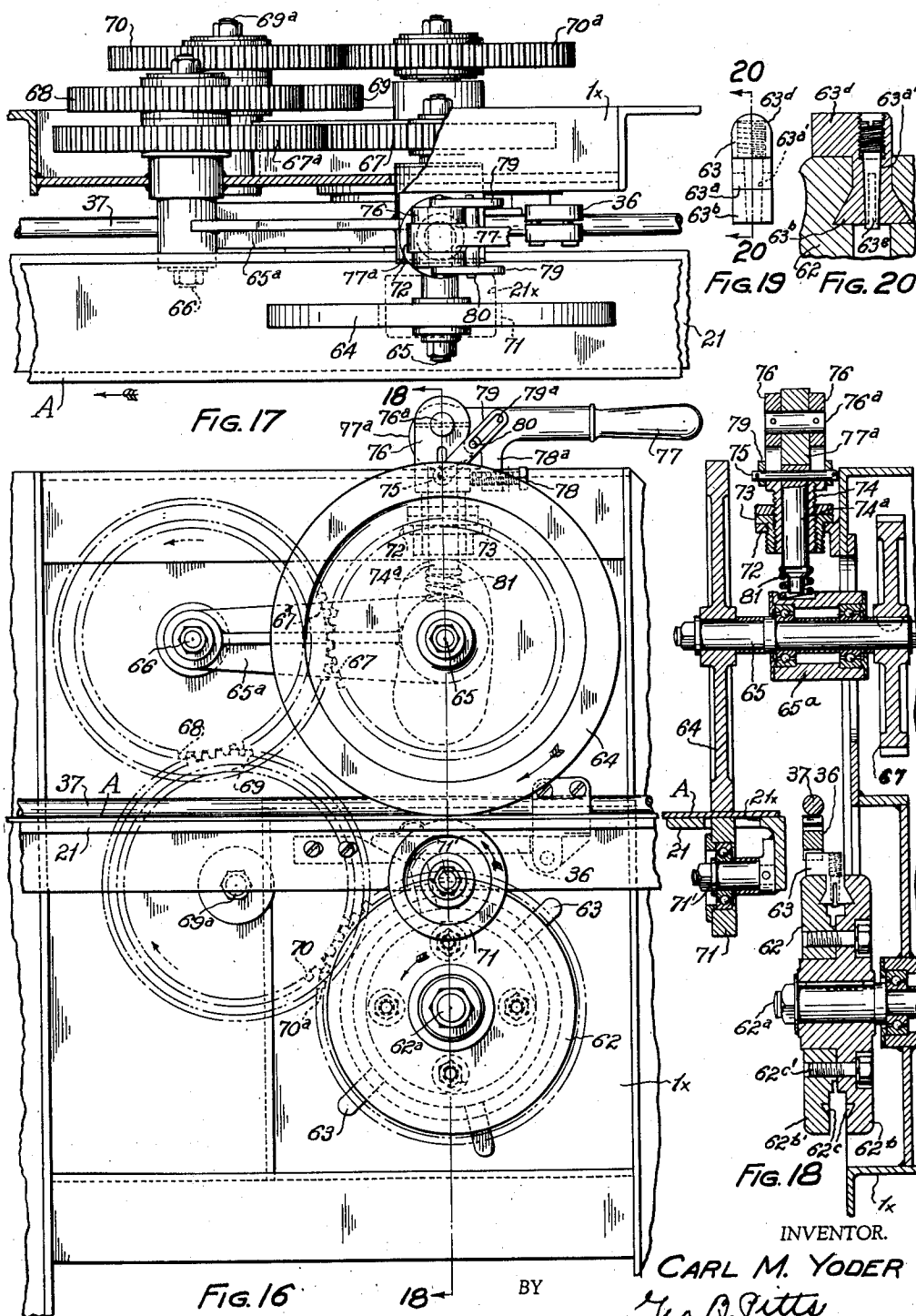
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2,301,236

APPARATUS FOR OPERATING ON SHEET MATERIAL

Filed July 21, 1939

7 Sheets-Sheet 5



Nov. 10, 1942.

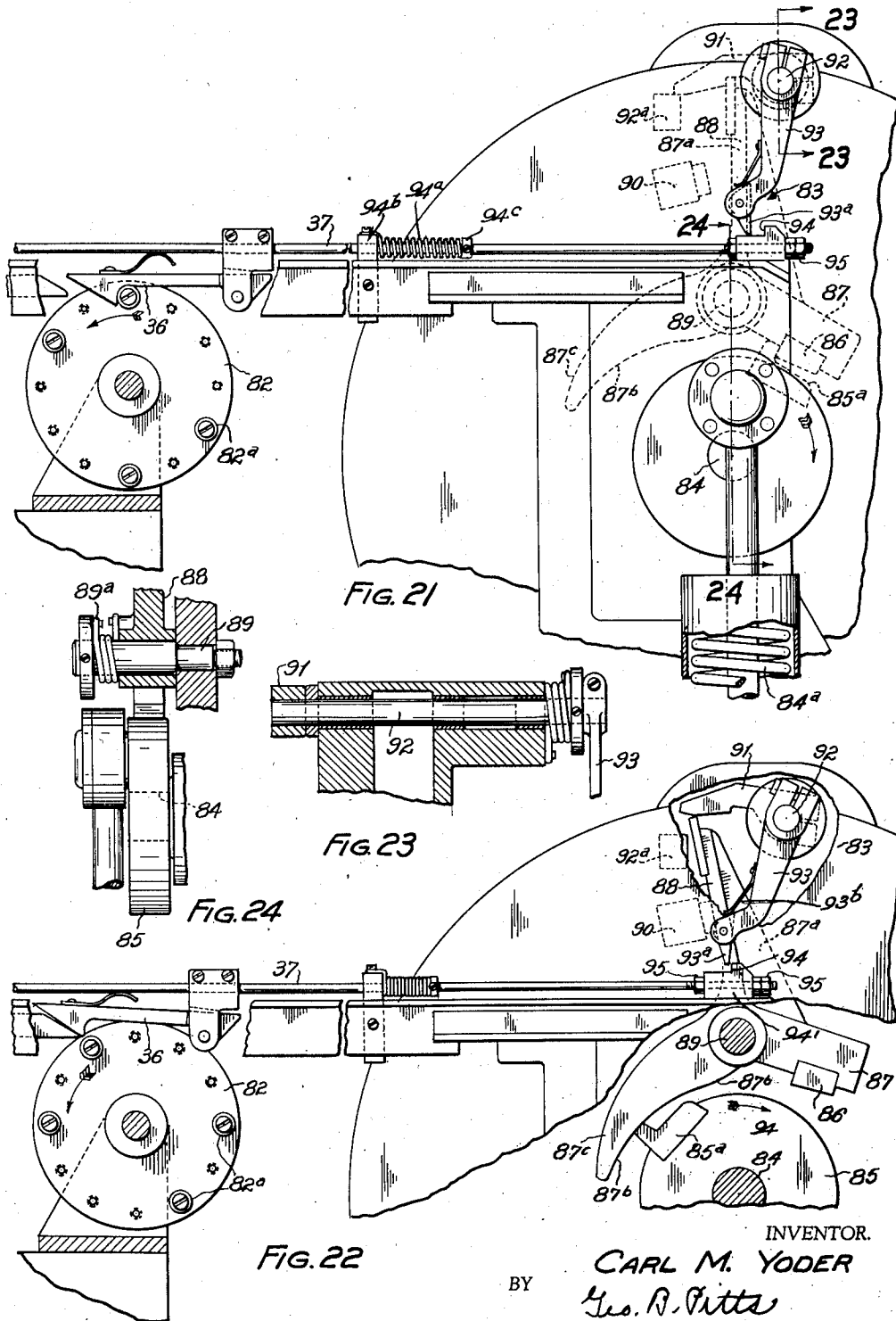
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2,301,236

APPARATUS FOR OPERATING ON SHEET MATERIAL

Filed July 21, 1939

7 Sheets-Sheet 6



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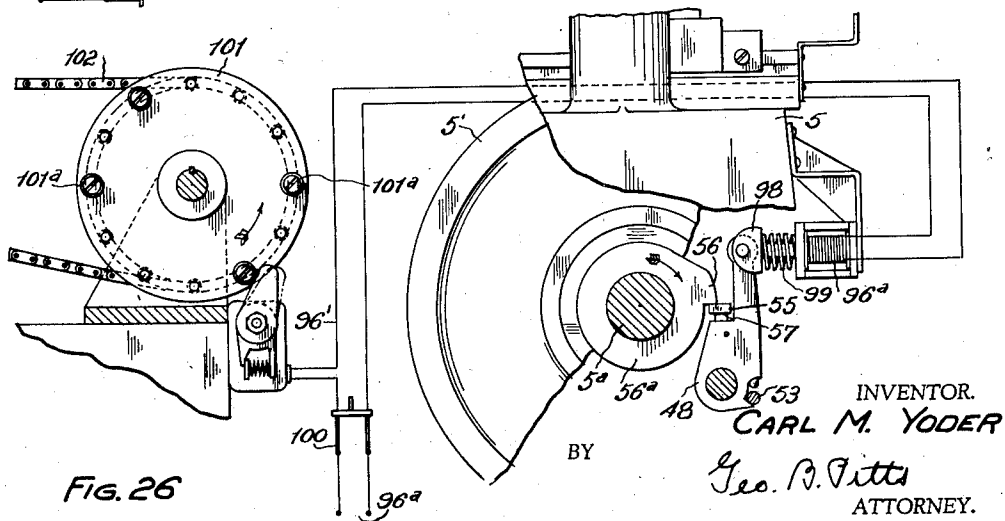
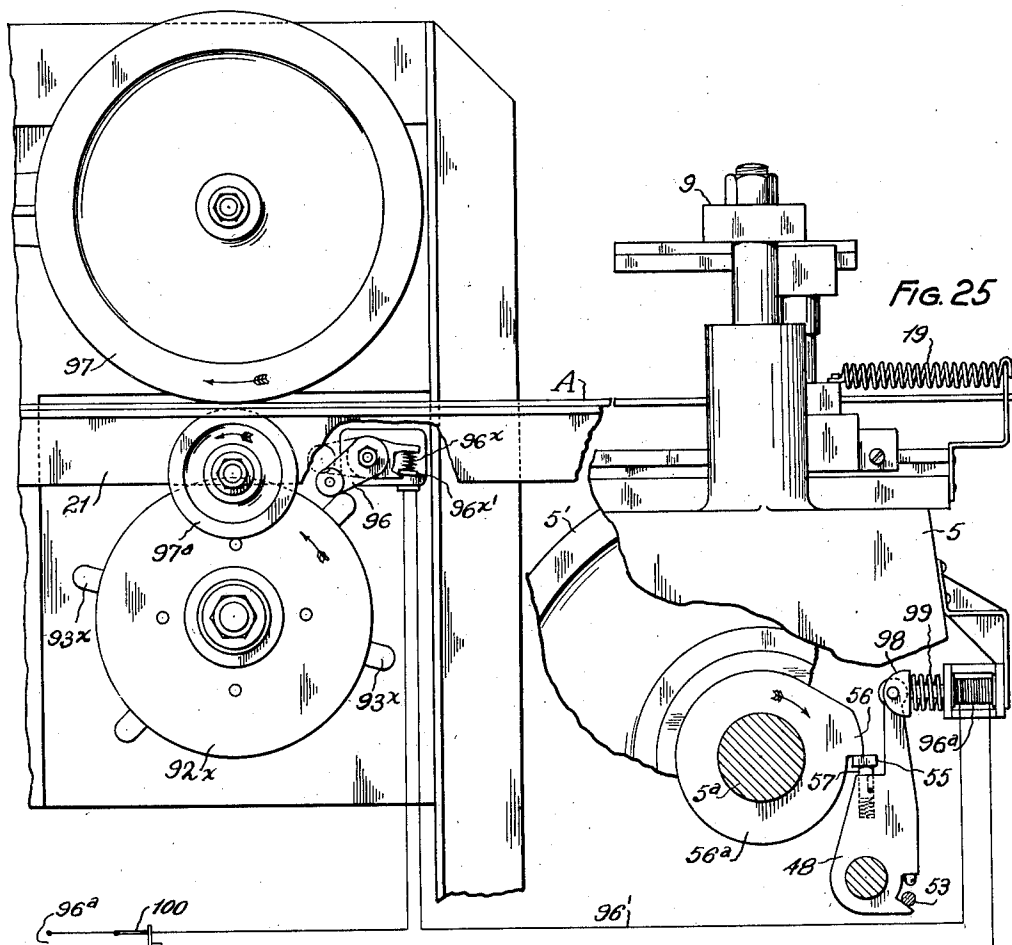
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2,301,236

APPARATUS FOR OPERATING ON SHEET MATERIAL

Filed July 21, 1939

7 Sheets-Sheet 7



UNITED STATES PATENT OFFICE

2,301,236

APPARATUS FOR OPERATING ON SHEET MATERIAL

Carl M. Yoder, Lakewood, Ohio

Application July 21, 1939, Serial No. 285,649

16 Claims. (Cl. 164—15)

This invention relates to apparatus for and process of operating upon sheet metal stock, and operates either on flat stock which is fed or stock which is fed and shaped into any form in cross section, the stock being then cut into sections.

One object of the invention is to provide an improved apparatus of this character wherein moving stock is operated upon by a tool arranged to be operated intermittently, whereby adjacent sections of the stock between the portions engaged by the tool may be of equal or non-equal length.

Another object of the invention is to construct an improved apparatus of this character wherein moving stock is successively cut on predetermined relatively spaced lines, whereby adjacent portions or sections defined by the cuts may be of equal or non-equal length.

Another object of the invention is to construct an improved apparatus for severing flat stock, or stock shaped therein, into sections of uniform or non-uniform length.

Another object of the invention is to construct an improved apparatus of this type wherein provision is made to punch or stamp a portion of the stock at uniform or non-uniform spaced points, form it into predetermined cross sectional shape and sever the stock into sections or lengths in line with selected apertures or between any two selected apertures.

A further object of the invention is to provide an improved process wherein sheet metal stock of indefinite length is punched or stamped at uniform or non-uniform spaced points, and finally severed into sections of uniform or non-uniform length.

Another object of the invention is to construct an improved apparatus of this type wherein provision is made for readily changing the spacing of the apertures and/or lengths of the severed sections.

Other objects of the invention will be apparent to those skilled in the art to which my invention relates from the following description taken in connection with the accompanying drawings.

In the use of the word punching or stamping or words of like import herein I have in mind the step of slitting or up-setting the metal at and inwardly of either or both edges of the stock, or between its edges, or blanking or notching out portions of the stock at either or both its edges or between its edges; in this connection the term "tool" is intended to comprehend a device capable of effecting any of these operations. Also, since

the mechanism for a slitting, up-setting, blanking or notching the stock, is similar to that used for severing the stock into lengths, except for the shape of the tool and die, the term "cutting" and the like are to be interpreted in a broad sense, the descriptive of rather than limiting the invention. Furthermore, in the use herein of the term "hollow bodies" I have in mind tubes or pipes wherein the side edges of the stock are related, to permit the welding thereof, and other cross sectional shapes, such as supporting columns for buildings, sash and door frames and the like, wherein the side edges of the stock are spaced from each other, one example of both forms thereof being shown in my co-pending application filed July 25, 1938, Serial No. 221,126, now Letters Patent No. 2,234,999, dated March 18, 1941.

In the aforesaid application I have disclosed apparatus wherein the preliminary apertures or notches upon the stock control the punching or stamping and severing mechanisms, whereby the cuts or notches are uniformly spaced and the stock, when finally severed, is formed into sections of uniform length. In the herein disclosed apparatus I have provided means which may be operated by the work or otherwise and set or arranged to uniformly or non-uniformly space the successive apertures upon the stock and severing means which may be operated by the work or otherwise and set or arranged to sever the stock in line with selected apertured or intermediate the apertures to provide successive sections of uniform or non-uniform length.

Referring to the drawings:

Fig. 1 is a plan view of an apparatus embodying my invention.

Fig. 2 is a side elevation.

Figs. 1 and 1a together constitute a plan view of an apparatus embodying my invention and capable of carrying out the steps of my process.

Figs. 2 and 2a together constitute a side elevation of the apparatus.

Fig. 3 is a fragmentary section on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary section on the line 4—4 of Fig. 2a.

Fig. 5 is a fragmentary plan view of parts in Fig. 6.

Fig. 6 is a view (somewhat enlarged) partly in side elevation and partly in section on the line 6—6 of Figs. 1 and 5.

Fig. 7 is a view of certain parts shown in Figs. 5 and 6, but illustrating the operation thereof to effect the cutting of the stock.

Figs. 8 and 9 are sections on the lines 3—3 and 9—9, respectively, of Fig. 6.

Fig. 10 is a plan view showing the formation of the stock into final shape with the preliminary punching at uniformly spaced points; a channel shape being shown for illustrative purposes.

Fig. 11 is a view similar to Fig. 10, but showing the preliminary punching at non-uniformly spaced points.

Fig. 12 is a side elevation of the part shown in Figs. 10 and 11.

Fig. 13 is a section on the line 13—13 of Fig. 12, but showing in dotted lines the progressive shaping of the stock in moving from the line x—x to the line 13—13.

Fig. 14 is an elevational view showing a modified form of tool locating member.

Fig. 15 is a section on the line 15—15 of Fig. 14.

Fig. 16 is a fragmentary side elevation of the machine showing certain modifications, wherein the tool locating member is driven by the moving stock.

Fig. 17 is a plan view of the construction shown in Fig. 16, parts being broken away.

Fig. 18 is a section on the line 18—18 of Fig. 16.

Fig. 19 is a detail view, somewhat enlarged.

Fig. 20 is a section on the line 20—20 of Fig. 19.

Fig. 21 is a fragmentary view showing another modified form of construction employing a different cutter operating mechanism.

Fig. 22 is a view similar to Fig. 21, but showing the release means in operated position.

Figs. 23 and 24 are fragmentary sections on the lines 23—23 and 24—24, respectively, of Fig. 21.

Fig. 25 is a fragmentary view (parts being broken away) showing a different modification.

Fig. 26 is a view similar to Fig. 25 but showing a different form of drive means for the tool locating member or device.

In the drawings, 1 indicates as an entirety a supporting means on which a preliminary punching mechanism, indicated as an entirety at 2, a shaping mechanism indicated as an entirety at 3 and a final cutting or severing mechanism indicated as an entirety at 4, are mounted. For convenience in manufacture and assembly and adjustment of each mechanism as a unit relative to the other mechanisms, and also because each mechanism may be associated with various types of mechanisms, the supporting means 1 consists of separate supports, namely 1a on which the mechanism 2 is mounted, 1b on which the mechanism 3 is mounted and 1c on which the mechanism 4 is mounted. The support 1a is provided with spaced standards 5 having suitable bearings to support a shaft 5a, carrying a cam 5b' to which reference will later be made. At one end the shaft 5a rotatably mounts a flywheel 5' which is continuously driven by a belt 5a' from a pulley 6 on the shaft of a motor 6a. Between the flywheel 5' and shaft 5a is a suitable clutch for connecting the shaft to the flywheel, so that by means of control elements (later referred to) the shaft is driven and stopped at the end of one revolution thereof, the effect of which is to operate the preliminary stock engaging tool, a down stroke and an up-stroke thereof; a friction member 7a (see Fig. 2) bearing upon the opposite end of the shaft 5a serves to stop its rotation after its release from the driven element of the clutch. As later set forth, the punch and its co-acting die or wall serve to punch the stock at predetermined spaced positions, as determined by the control elements, such

aperture making in the illustrated example consisting of centrally disposed openings a (see Fig. 10) spaced longitudinally of the stock, each opening being formed by the down stroke of the tool. The standards 5 are provided with upwardly disposed hollow extensions 7 forming guides for slidable rods 8 carrying at their upper ends a cross head 9 and rigidly connected at their lower ends to a yoke 10 the sides of which are formed with elongated openings to accommodate the shaft 5a and permit the yoke to reciprocate up and down. The lower end of the yoke 10 is provided with a depending pin 11, which extends through and is guided by the walls of a bushed collar 12 suitably seated in the top wall of the support or base 1a. Between the flange of the collar 12 and lower end of the yoke 10 and surrounding the pin 11 is an expansion spring 13, which normally tends to bias the yoke 10 upwardly and through it to move the cross head 9 upwardly. Within and adjacent the lower end of the yoke 10 I mount a shaft 14 on which is loosely mounted a roller 14a in engagement with the cam 5b', the throw of which serves to move the yoke 10 and cross head downwardly in opposition to the spring 13. The cross head 9 is provided with a depending block 16 between which and a plate 17 provided on the upper ends of the standards 5, are slidably mounted the die and support for the preliminary tool. At its forward end the plate 17 is provided with brackets 18 to the outer ends of which springs 19 are anchored at one end, their opposite ends being connected to the die block or support for the die which co-acts with the tool and normally tend to move it and the tool rearwardly against a stop 20, so that when the die and tool move forwardly with the material A and are disengaged therefrom, as later set forth, they will be automatically returned to their normal position against the stop 20. At its rear end the plate 17 is provided with a bracket 17a which and a bracket 2a on the base 1b support a table 21 over which the material A moves in feeding from the preliminary punching mechanism 2 to the shaping mechanism 3, the table 21 having a length to provide for maximum adjustment of the element, which is mounted adjacent thereto, relative to the tool and controls the operation of the clutch to effect operation of the tool.

On their front sides, the standards 5 are provided with suitable brackets 5b, which support at their upper ends a freely rotatable roller 5c over which the stock is fed to the die.

The die preferably consists of a sectional block 22 providing an opening through which the stock feeds and walls which co-act with the tool 23 (see Fig. 3); obviously more than one tool may be provided dependent upon the resulting product to be produced. The die block is mounted on a slide 24 which is provided on its opposite lower sides with inwardly extending strips arranged to engage ways or guides on the plate 17 to reciprocatably mount the block on the latter; whereas the tool 23 is fixed to a slide 25 which is provided on its opposite upper sides with inwardly extending strips arranged to engage ways or guides on the depending block 16 to reciprocatably mount the tool on the latter. The slides 24 and 25 are connected together for reciprocation as a unit between the plate 17 and head 9 by pilot pins 26, preferably mounted in the die block 22 and telescopically fitting sleeves 26a supported in and depending from the slide 25, as shown in Fig. 3. The mounting of the die and tool as above de-

scribed permits them to move forwardly with the stock or work during operation thereon independently of the down and up stroke of the tool and also in advance of the down stroke of the tool, since the control elements (later referred to) for releasing the one revolution clutch are connected to and operate through the die block to drivingly connect the clutch to the shaft 5a, as later set forth.

The stock A is fed or moved relative to the operation performing mechanism 2 by the shaping mechanism 3, the rolls of which are driven. The mechanism 3 consists of a plurality of sets of rolls 3a suitably mounted in housings 3b, the number of sets of rolls 3a being dependent upon the cross sectional shape to be imparted to the stock and thickness thereof, as well as other conditions. The shafts for the shaping rolls of each set are geared together and drivingly connected to a shaft 27, such gearing and connections being mounted in casings 27a and the shaft 27 being driven through a suitable clutch 28 by a power means indicated at 29 (Figs. 1 and 2) deriving its power from a motor (not shown) within the support 1b. The clutch 28 is operated by the linkage 30 supported in position to be grasped by the operative. The shaping rolls 3a herein shown for illustrative purposes are arranged to progressively bend the lateral portions of the stock (see dotted lines in Fig. 13) to form a channel A', as shown in full lines (Figs. 10, 11, 12 and 13). As shown in Figs. 1a and 2a, the sets of driven rolls 3a are utilized to feed the stock, that is, to draw it from a coil or other source of supply and feed it through the die 22 of the operation performing mechanism 2; but if desired the mechanism 3 may include a set of pinch rolls in front of the first set of shaping rolls.

The elements or means for controlling the operation of the cross head 9 are indicated as an entirety at 31 and comprise the following: 32 indicates a shaft mounted in a standard 32', which is adjustably fixed to the support 1b. That end of the shaft 32 remote from the stock support or table 21 is provided with a sprocket 33 engaged by a chain 33a, the latter being driven by a sprocket 34 fixed to the extended end of the lower shaft for the first set of rolls 3a of the mechanism 3. The other end of the shaft 32 is provided with a tool locating or metering member 35 consisting of a disk provided with one or more lugs or projections, each arranged to releasably engage with a dog 36. By preference, the lugs 35a are disposed in an annular series on the outer face of the disk and spaced relatively to each other in any predetermined manner so as to operate the dog 36 as each passes the latter. The lugs 35a are removably mounted on the disk, each consisting of a screw loosely supporting a roller and threaded at its inner end into an opening 35b formed in the disk. The openings 35b in the disk 35 are preferably uniformly spaced therearound to provide for the maximum number of operations of the dog 36, each of which effects operation of the cross head 9 as the disk 35 rotates, but by removing certain of the lugs, the number of operations of the dog 36 may be reduced, whereby the angular movement of the disk 35 between each lug and the succeeding lug may be increased or decreased dependent upon the space between adjacent openings or multiples thereof, such spacing between adjacent lugs determining the spacing of the openings a in the stock A. It will be understood that the disk 35 is removable from the shaft 32 so that a disk with

lugs 35a mounted thereon in any predetermined order may be substituted to avoid changing the lugs on the disk. The dog 36 is pivoted to a rod 37, which is connected at its inner end through a plate 37a to the die block 22, so that when the dog 36 is engaged by each of the lugs 35a and moved forward thereby, the die block 22 is moved relative to the plate 17 in opposition to the springs 19, and the shaft 5a is connected to the one revolution clutch as later set forth. The dog 36 is pivoted to a supporting device 38 which is adjustably fixed to the rod 37 to position the nose 36a of the dog in a predetermined relation to the lugs 35a as they approach and recede from their uppermost position. The rod 37 is slidably supported on a plurality of brackets 39 suitably fixed to the work support 21. The opposite ends of a contractile spring 40 are fixed to the outermost bracket 39 and a head 40a on the outer end of the rod 37, this spring being put under tension when the rod 37 is moved endwise (toward the left as viewed in Figs. 1a, 2a, 5, 6 and 7) by the dog 36 to supplement the action of the springs 19 in returning the die, rod and dog to normal position after each punching operation. The dog 36 is provided with a leaf spring 41, the free end portion of which engages the rod 37 and normally tends to swing the dog downwardly, which movement of the dog is limited by the engagement of its tail portion 36b with the lower side of the supporting device 38. Each lug 35a in its movement counter-clockwise (see Fig. 6) engages with and moves the dog 36 a predetermined distance and automatically disengages therefrom as the lug 35a continues in its path of movement. The nose 36a may be shaped to permit its ready disengagement from each lug, but preferably the nose 36a is slightly recessed and means are provided for positively moving the nose 36a out of the path of movement of each lug at a predetermined position, these means consisting of related inclines or cams 42a, 42, provided respectively on the outer end of the dog 36 and the front end of a plate 42b secured by screws 42c the side wall of the work support 21.

As will be understood from Figs. 6 and 7, the engagement of the cam 42a with the cam 42 in the forward movement of the dog serves to swing the latter upwardly and thus effect the disengagement of the dog's nose 36a from each lug. Accordingly, these means (1) may be arranged to release the dog from each lug in advance of the release which would otherwise occur due to the path in which the lugs travel and (2) provide for the operation of the dog 36 and movement of the die therewith to effect actuation of the tool 23, as later set forth. As shown in Fig. 6, the side wall of the table 21 is formed with elongated slots through which the screws 42c extend, the slots permitting the plate 42b to be adjusted to accurately relate the cam 42 on its front end to the cam 42a on the dog to effect the positive release of the latter from each lug at the desired time.

As the dog 36 is connected to the rod 37, the latter moves the die and tool therewith and such movement effects operation of the clutch to rotate the shaft 5a and reciprocate the tool by means of the following devices; 43 indicates a pair of spaced arms fixed to the brackets 13 and provided adjacent their outer ends with inclined walls 43a. 44 indicates a release member pivotally connected at its inner end to the slide 24 and disposed between the arms 43 and carrying at its outer end laterally projecting pins 45 nor-

mally disposed rearward of the inclined walls 43a and arranged to engage therewith in the forward movement of the slide, whereby the walls 43a serve to swing the release member upwardly as it moves forwardly with the slide 24. On its lower side, the release member 44 is provided with a shoulder 44a arranged to engage and swing a lever 46 suitably fulcrumed on a depending bracket 46a, when the slide is moved forwardly, as already set forth, the release member 44 then disengaging the lever 46 by reason of the engagement of the pins 45 with the inclined walls 43a, which swing the release member upwardly, as just set forth. The walls 43a permit the release member 44 to swing downwardly into operative position, with the shoulder 44a behind the lever 46, when the slide 24 is returned or moved rearwardly by the springs 19. The other end of the lever 46 is pivoted to one end of an arm 47, and the opposite end of the arm 47 is pivotally connected to one end of a trip device 48, mounted to rock on a stud shaft 49. The trip device 48 is formed with a recess 51 in which is slidably mounted a plunger 53a, an expansion spring 52 being interposed between the inner end of the plunger and the bottom of the recess and normally tending to project the plunger outwardly. As shown, the plunger 53a is disposed in engagement with a stationary pin or abutment 53, so that the expansion of the spring serves to swing the device 48 about the shaft 49, counter-clockwise as viewed in Fig. 7, such movement being limited by the engagement of a projection 54 on the device 48 with the abutment 53, as shown. The counter-clockwise movement of the trip device 48, through the arm 47, serves to return the lever 46 to its normal position, which is predetermined by reason of the engagement of the projection 54 with the abutment 53, so as to be operatively related to the shoulder 44a when the release member is returned to its rearmost or normal position. The trip device 48 is provided with a shoulder 55, which—when the lever 46, arm 47 and trip device are in their normal positions as shown in Figs. 1a and 7—lies in the path of movement of the dog 56 on a collar 56a. The collar 56a is connected to that element of the one revolution clutch 56b which controls the connection with and disconnection of the clutch from the shaft 5a. As the clutch is of well known construction, it is not illustrated in detail. As will be understood, when the dog 56 is in engagement with the shoulder 55, the clutch is ineffective and disconnected from the shaft 5a, but upon movement of the shoulder 55 to the position shown in dotted lines in Fig. 7, due to operation of the lever 46, the collar 56a will be released and thus effect operation of the clutch to rotate the shaft 5a. As the lever 46 is released from the shoulder 44a of the release member 44 in co-ordinated relation to and immediately following the disengagement of the shoulder 55 from the dog 56, and is then returned to its normal or predetermined position under the influence of the spring 52, it will be seen that the shoulder 55 is re-positioned in the path of movement of the dog 56 to arrest rotation of the collar 56a at the end of one revolution thereof, so that the clutch is released from the shaft 5a when the latter has made one revolution. The shoulder 55 is preferably mounted on a plunger 57 which slidably fits a recess formed in the walls of the device 48, an expansion spring being interposed between the inner end of the plunger 57 and the bottom of the

recess and normally tending to slide the plunger outwardly, this arrangement serving as a cushion to absorb the blow incident to the engagement of the dog 56 with the shoulder 55. The plunger 57 is provided with a pin which slides in a slot formed in the walls of the device 48, the end walls of the slot serving to limit the movement of the plunger 57 in either direction.

58 indicates a guide for the stock A mounted on the support 21.

It will be understood that the mechanism 2 may be operated independently of any other mechanisms, for example, upon stock previously cut into lengths; also where shaping of the stock is not required, it may be combined with a cut-off or severing mechanism such as shown at 4. In these referred to examples, the stock may be previously shaped, in which event the opening through the die block is shaped in cross section to accommodate the shape of the stock. In these referred to examples, the tool locating member may be drivingly connected to the motor 6a or otherwise driven.

It will also be noted that the driving means between the shaft 32 and shaping roll shaft may be of any desired construction and that the speed of the shaft 32 relative to the roll shaft may be of any desired ratio to provide a predetermined relation between the rotary movement of the disk 35 and feed of the stock A so that the successive operations of the dog 36 by the lugs 35a will effect the operation of the tool to properly space the openings a.

Figs. 14, 15, 16, 17 and 18 illustrate modified forms of tool locating or metering devices. As shown in Figs. 14 and 15, the device consists of a disk 35x formed with a plurality of arcuate slots 35x' in end to end relation and concentric to the disk axis and the shanks of the lugs 35a extend through the slots and are secured thereto by nuts 35', the slots permitting the lugs to be adjusted relatively to each other. The device shown in Figs. 16, 17 and 18 is later referred to.

The stock may be severed into sections by any suitable cut-off or severing mechanism 4, but preferably by a mechanism employing a tool locating or metering device so that the severing of the stock may be on transverse lines through or between the openings and uniformly or non-uniformly spaced, whereby the sections may be of equal length, or certain thereof may differ in length from an adjacent section. In order to obtain these advantageous results, I have shown a severing mechanism 4, which is similar in construction and operation to the mechanism 2, the tool locating or metering device being indicated at 59 and driven by a chain 60 from the shaft for the lower roll of the last set of rolls 3a of the mechanism 3, thereby synchronizing the operation of the cutting element 51 (see Fig. 4) with the rate of feed of the shaped stock A'.

In the arrangement shown, the tool locating device 59 is provided with two diametrically arranged lugs 35a, so that in each revolution of this device the stock A' is cut into two sections of equal length, but by changing the angular relation of one lug relative to the other lug, one severed section would be longer than the other section.

It will be understood that since the mechanism 4 is similar in construction and operation to the mechanism 2 it is not illustrated in detail and further description thereof appears to be unnecessary. It will also be understood that my invention is not limited to a combination wherein the

mechanism between the mechanism 2 and 4 is constructed to shape the material A, but other mechanisms may be employed, for example, a mechanism for slitting, trimming or leveling the stock. Where such a mechanism is omitted, the tool locating member 59 for the severing mechanism may be driven by a suitable motor. In the arrangement shown, the speed of the lugs on each tool locating member approximates the speed of the stock, so that the die and cutter are moved with the stock by each lug 35a until the dog 36 is released therefrom.

It will thus be noted that the tool locating member and the operating connections between it and the release means for the clutch 53b' serve the dual function of operating the release means and moving the die and cutter with the stock during the cutting operation, until the dog 36 is released, but where other means are employed for effecting this fixed relation between the stock die and cutter (for example, as shown in Letters Patent No. 2,155,396 to Alexander Borzym), the operating connections may be directly related to the release means. However, I may provide between each tool locating member and its driving means, suitable means 60' for regulating the speed of the tool locating member so that the speed of the lugs in their orbit will be faster or slower than the speed of the stock to provide a predetermined spacing of the cutting or length of the severed sections; this differential speed relation may be provided since the die and cutter being free to slide on the plate 17 and block 16, they will move with the stock during engagement of the cutter therewith.

It will be noted however, that in all speed relations between the tool locating or metering lugs 35a and stock, the cam 42 must be so set that release of the dog 36 from each lug takes place simultaneously with or following the engagement of the cutter with the stock, to prevent rearward movement of the die and cutter (prior to such engagement) under the influence of the adjacent springs 19.

Referring to Figs. 16 to 20, inclusive, 52 indicates a tool locating or metering device keyed to a shaft 62a, which is suitably mounted in the frame 1x. The tool locating or metering device is provided with one or more operating lugs 63, predeterminedly spaced for the purposes as already set forth and each arranged to engage and move the dog 36, which in turn moves the rod 37 to operate the release means as already described in connection with Figs. 1 to 13, inclusive. The tool locating or metering device is driven through a train of changeable gears by a roll 64 which engages with and is rotated by the moving stock A on the table 21. The roll 64 is removably fixed to one end of a shaft 65, which is mounted in suitable bearings provided in the outer end of an arm 65a, the inner end of the arm being pivoted on a shaft 66 suitably mounted on the frame 1x, whereby the arm 65a may be operated about the shaft to insure adequate engagement of the roll 64 under pressure with the stock, to effect positioning of the stock on the table 21 or to permit ready removal of the roll 64 where a roll of a different diameter is required. The shaft 65 is provided with a gear 67 in mesh with a gear 67a keyed to the shaft 66. The shaft 66 is provided with a second gear 68 in mesh with a gear 69 fixed to a shaft 69a, which is suitably mounted in the frame 1x. The shaft 69a is provided with a second gear 70 in mesh with a gear 70a fixed to the shaft 62a. As above set forth

the roll 64 and gears are removable, whereby any desired speed of the tool locating device 62 may be provided for. By preference I provide a backing roll 71 below and in engagement with the moving stock, in alignment with the roll 64, so that when the latter is positioned under pressure, as later set forth, the roll 64 will be rotated by the stock without danger of slippage; the table 21 being formed with an opening 21x to permit the roll 71 to engage the moving stock. The backing roll 71 is freely rotatable on anti-friction bearings on a shaft 71' preferably secured to the side wall of the table 21. For the purpose of positioning the roll 64 in engagement with and under pressure against the stock, I provide on the frame 1x a bracket 72 which is formed with a threaded opening to receive an externally threaded collar 73. The collar 73 is internally threaded to receive and support an externally threaded, hollow member 74 forming a guide for a thrust device or plunger 74a. The upper end of the plunger 74a is provided with a transversely disposed pin 75 the opposite ends of which extend through elongated slots formed in a pair of spaced plates 76 and connects the plunger thereto. The upper portions of the plates 76 are connected to the opposite ends of a shaft 76a on which the inner end of a lever 77 swings, the outer end of the lever terminating in a suitable handle. The inner end of the lever 77 is shaped to provide on its periphery a cam 77a the high spot of which is arranged to engage the upper end of the plunger 74a and force it downwardly when the lever 77 is swung to the position shown in Figs. 16, 17 and 18, the high spot of the cam being related to the axis on which the lever 77 swings to lock the lever in operated position. A screw 78 adjustably mounted in a lug 78a provided on the lever 77 and arranged to engage one of the plates 76 serves to limit the movement of the lever so as to prevent movement of the high spot of the cam to a point where the plunger would be relieved. The opposite ends of the pin 75 pivotally support a pair of links 79 formed with elongated slots 79a throughout their outer end portions. The slots 79a receive pins 80 projecting laterally from the opposite sides of the lever 77, the pins 80 and links 79 serving to connect the plunger 74a to the lever so that when the lever is swung upwardly following the release of the cam from the plunger, the latter will be lifted. A coiled spring 81 is interposed between the lower end of the plunger 74a and the arm 65a so that the roll 64 may accommodate itself to slight variations in the thickness of the stock and maintain uniform pressure thereon. The upper end of the spring 81 fits into an annular recess formed on the lower end portion of the plunger 74a to connect the spring thereto, so that when the plunger is raised, pressure of the roll 64 on the stock is relieved.

In these views I have shown a modified form of tool locating device 62 which may be employed in the form of construction shown in Figs. 1 to 13 or the forms hereinafter referred to. The device 62 consists of a main section 62b and a removable annular section 62b' having on their opposed faces annular recesses 62c related to form a continuous slot in which the lugs 63 are adjustably and removably mounted. The section 62b' is removably secured to the section 62b by bolts 62c'. As shown in Figs. 19 and 20, each lug 63 consists of a body portion 63a formed with a through opening 63a' and having depending side members 63b, the outer walls of which are inclined

downwardly and outwardly to fit correspondingly shaped walls of the recesses 62c. The upper end of the body portion 63a is provided with a laterally extending wall 63d for engagement with the nose of the dog 36 as shown in Fig. 18. The lugs 63 may be secured in position by the annular section 62b', but to permit independent adjustment of the lugs I taper the inner side walls of the members 63b and insert therebetween a tapered pin 63e which operates to spread the members 63b into clamping engagement with walls of the recesses 62c. The upper end of the opening 63a' is enlarged and threaded for engagement by the externally threaded head of the pin 63e, so that when the latter is rotated its tapered shank is forced downwardly to spread the side members 63b.

Referring to Figs. 21 to 24, inclusive, 82 indicates the tool locating device provided with lugs 82a each arranged to engage and operate the pawl 36, which in turn moves the rod 37 endwise to effect operation of the release means, indicated as an entirety at 83. The release means 83 control the locking and release of a shaft 84, which is initially rotated by springs (one being shown at 84a) and power driven to complete its rotation and re-set the springs, for example, as set forth in the aforesaid Letters Patent No. 2,155,396, the rotation of the shaft serving to reciprocate the cross head (not shown) which carries the tool. In this arrangement, the shaft 84 is provided with a disk 85 having on its periphery a lug 85a arranged to engage a release device 86 carried by one arm 87 of a lever 88. The lever 88 is fulcrumed on a shaft 89 and normally biased (counter-clockwise as viewed in Fig. 22) to the position shown in Fig. 22 by a coiled spring 89a (see Fig. 24) against a stop 90. Another arm 87a of the lever 88 is arranged to engage a shoulder on a trip device 91 (as shown in dotted lines in Fig. 21). The trip device 91 is fixed to one end of a rock shaft 92, which is normally biased (counter-clockwise as viewed in Figs. 21 and 22) against a stop 92a and carries at its other end an arm 93. The outer end of the arm 93 is arranged to be engaged by a shoulder 94 provided on the adjacent end of the rod 37, so that when the rod is moved endwise by each of the lugs 82a on the tool locating member, the arm 93 is swung to the position shown in Fig. 22 to rock the shaft 92, which in turn swings the trip device 91 upwardly to release the lever 88. The lever 88 is operated under the influence of the spring 89a to release the lug 85a, whereby the springs 84a start the rotation of the shaft 84. As the lug 85a approaches its starting position it engages the cam 87b on the lever arm 87c and swings the lever 88 clockwise to move the release device 86 into the path of movement of the lug 85a and to position the lever arm 87a behind the shoulder on the trip device 91, which holds the lever against counter-clockwise movement and permits the release device 86 to stop the shaft 84 upon engagement of the lug 85a therewith. The rod 37 is returned to normal position by spring 94a interposed between an abutment 94b and a collar 94c fixed to the rod 37. The shoulder 94 is provided on a fitting 94' through which the rod 37 extends the rod being threaded to take nuts 95 between and by means of which the fitting may be adjustably secured to the rod. The outer end of the arm 93 is provided with a pivoted dog 93a which is locked against movement in one direction so that the shoulder 94 may transmit its movement through the dog to the

arm 93, but is free to swing in the opposite direction so as to permit it to swing in opposition to a spring 93b and ride the shoulder 94 in the return movement of the latter.

The tool locating device 82 may be driven in the manner shown in Figs. 1 to 13, inclusive or as shown in Figs. 16, 17 and 18.

Fig. 25 illustrates a further modified form of cutting mechanism wherein the tool locating member 62x is provided with operating lugs 63x, each arranged to operate a normally open snap switch mounted in a casing 96, as the tool locating device rotates, to close a circuit 96', in which is connected the coil of a solenoid 96a. The tool locating member 62x is driven by a roll 97 engaging the moving stock A in opposed relation to a backing roll 97a. The roll 97 drives the tool locating device through a train of change gears (not shown) as shown in Figs. 16, 17 and 18. The cutting mechanism shown is similar to each of the mechanisms 2 and 4, except that the trip device 43, which releases the collar 56a to effect the connection of the one revolution clutch to the shaft 5a and re-engages the collar to disconnect the clutch from the shaft is controlled by the solenoid 96a. The snap switch may be of any desired construction. The movable element of the switch is provided with an arm 96b, the outer end of which is arranged to be engaged by the lugs 63x. The arm 96b is extended rearwardly and provided with spaced upper and lower lugs 96c, 96c', which straddle a stop 96x' suitably fixed to the casing 96. An expansion spring 96x is interposed between the stop 96x' and upper lug 96c and normally tends to bias the arm 96b counter-clockwise as viewed in Fig. 25 and thus maintain the switch in open position with the lug 96c' against the stop 96x', the latter serving to limit the swinging movement of the arm under the influence of the spring 96x to position the outer end of the arm 96b in a predetermined relation to the path of movement of the operating lugs 63x. The outer end of the arm 96b is preferably provided with a roller with which the lug 63x engages. The solenoid may also be of any desired construction, the outer end of its core being provided with a head 98 which is pivoted to the upper end of the trip device 43. A spring 99 is coiled around the solenoid core between the head 98 and adjacent end of the coil support, the spring normally tending to swing the trip device 43 counter-clockwise, as viewed in Fig. 25, against the stop 53, to position the shoulder 55 on the plunger 57 in the path of movement of the dog 56 on the collar 56a. In operation, each operating lug 63x operates the switch to close the circuit 96' and energize the coil of the solenoid, the effect of which is to move the solenoid core endwise in opposition to the tension of the spring 99 and swing the trip device clockwise, whereby the collar 56a is released. As the solenoid coil is energized momentarily, its core is immediately released for movement in the opposite direction by the spring, whereby the shoulder 55 is re-positioned for engagement by the dog 56 to stop the collar 56a. The circuit 96' is supplied with current from mains 96a upon the closing of a main switch 100. The tool locating member 62x and the mounting of the operating lugs 63x thereon are similar to like parts shown in Figs. 16, 18, 19 and 20.

Fig. 26 illustrates a further modified form similar to that shown in Fig. 25 except that the tool locating device, indicated at 101 is driven by a chain 102 from a source of power, for example,

the roll shaft of a shaping mechanism as shown in Figs. 1 to 13, inclusive. In this form of construction, the operating lugs 101a are removably mounted as shown in Fig. 8. In the forms of construction shown in Figs. 25 and 26, the switch 96 may be located at any desired position about the axis of the tool locating device and the operating lugs may be positioned in closer relation as compared to their spacing where the lugs engage and operate a pawl.

It will be noted that I have shown in Figs. 16 to 26 several modified forms of mechanism, each of which may be adapted to effect a preliminary punching of the stock or severing thereof into sections.

To those skilled in the art to which my invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of my invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

From the foregoing description it will be noted that I provide a mechanism wherein the device which operates on moving stock may be controlled in any predetermined manner, by a tool locating member, to operate intermittently, whereby the stock is cut at uniformly spaced points or at points which are non-uniformly spaced. Where the apparatus consists of a preliminary operation-performing mechanism, as shown at 2, and a severing mechanism, as shown at 4, the severing device may be controlled independently of the tool for the preliminary operation-performing mechanism so as to sever the stock into sections of uniform length or where certain thereof differ in length from other sections. In the forms of construction wherein the tool locating member is driven by the moving stock, the periphery of the roll that engages therewith may be provided with suitable friction material. Where yieldable material (such as rubber) is employed to increase the friction of this roll, the spring 31 (see Fig. 16) may be omitted.

What I claim is:

1. In apparatus of the class described, the combination with a support over which stock moves, a head arranged to reciprocate on said support, connected together die and work-performing tool slidably engaging said support and head, power means normally disconnected from said head, means actuated by the movement of said die on said support for connecting said power means to said head for operating the latter to effect operation on the stock by said tool and die, a rotatable metering member provided with lugs spaced about its axis, a rod slidably mounted on said support and connected to said die, a dog carried by said rod and arranged to be engaged by each of said lugs, whereby each lug moves the rod, die and cutter in one direction, means operated by said rod for operating said connecting means, and a spring for moving the rod, die and tool in the opposite direction.

2. In apparatus of the class described, the combination with a stationary support having guides and means for continuously feeding work relative to said support, of a reciprocable head mounted in said guides, members slidably mounted on said support and head and connected for movement as a unit thereon, co-operating work-performing elements carried by said members, power means, mechanism normally disconnected from

from said power means for reciprocating said head, means for connecting said mechanism to said power means, said connecting means being connected to and operated by one of said slidable members to operate said head in co-ordinated relation to the movement of said members, a driven disk provided with a lug, connector connected to one of said slidable members and provided with a dog normally arranged in the path of movement of said lug through a portion of its orbit, and arranged to be engaged and moved thereby to slide said members in one direction, and means for moving said members and connector in the opposite direction.

3. In apparatus of the class described, the combination with a stationary support having guides and means for continuously feeding work relative to said support, of a reciprocable head mounted in said guides, members slidably mounted on said support and head and connected for movement as a unit thereon, co-operating work-performing elements carried by said members, power means, mechanism normally disconnected from said power means for reciprocating said head, means for connecting said mechanism to said power means, said connecting means being connected to and operated by one of said slidable members to operate said head in co-ordinated relation to the movement of said members, a driven disk provided with a lug, a connector connected to one of said slidable members and provided with a pivoted dog normally arranged in the path of movement of said lug through a portion of its orbit, and arranged to be engaged and moved thereby to slide said members in one direction, a device in the path of movement of said dog for positively disengaging it from said lug, and means for returning said members and connector in the opposite direction.

4. In apparatus of the class described, the combination with a stationary support having guides and means for continuously feeding work relative to said support, of a reciprocable head mounted on said support and head and connected for movement as a unit thereon, co-operating work-performing elements carried by said members, power means, mechanism normally disconnected from said power means for reciprocating said head, means for connecting said mechanism to said power means to operate said head in co-ordinated relation to the movement of said members, a device connected to and operated by one of said slidable members for operating said connecting means, a driven disk provided with a lug, means on said support for disconnecting said device from said connecting means, a connector connected to one of said slidable members and provided with a dog normally arranged in the path of movement of said lug through a portion of its orbit, and arranged to be engaged and moved thereby to slide said members in one direction, and means for moving said members and connector in the opposite direction.

5. In apparatus of the class described, the combination with a stationary support having guides and means for continuously feeding work relative to said support, of a reciprocable head mounted in said guides, members slidably mounted on said support and head and connected for movement as a unit thereon, co-operating work-performing elements carried by said members, power means, mechanism normally disconnected from said power means for reciprocating said head, means for connecting said mechanism to said power means, to operate said head in co-ordi-

nated relation to the movement of said members, co-acting devices, one carried by said support and the other connected to one of said slidable members, for controlling the operation of said connecting means, a driven disk provided with a lug, a connector connected to one of said slidable members and provided with a dog normally arranged in the path of movement of said lug through a portion of its orbit, and arranged to be engaged and moved thereby to slide said members in one direction, and means for moving said members and connector in the opposite direction.

6. An apparatus as claimed in claim 2, wherein the disk comprises a member formed with an annular series of transverse openings and lugs removably mounted in certain or all of said openings.

7. An apparatus as claimed in claim 2, wherein the disk comprises a member formed with arcuate slots disposed in end to end relation about its axis and one or more lugs are adjustably mounted in each slot.

8. An apparatus as claimed in claim 2 wherein the drive means for the disk consist of a roll engaging with and driven by the stock.

9. An apparatus as claimed in claim 2 wherein the drive means for the disk consists of aligned rolls engaging opposite sides of the stock and driven thereby, one of said rolls being drivingly connected to said disk means for operating the latter, and means for movably mounting one of said rolls, said mounting means including devices for effecting pressure of the adjacent roll against the stock.

10. An apparatus as claimed in claim 2 wherein the drive means for the disk consists of a removable roll engaging with and driven by the stock and change gears between said roll and said disk for driving the latter.

11. An apparatus as claimed in claim 2, wherein the disk comprises a main section and a removable annular section, said sections being formed with related recesses forming a continuous circumferential slot, operating devices mounted in said slot and means for adjustably securing each device to the walls of said slot.

12. In apparatus of the class described, the combination with a work-performing mechanism for forming apertures in continuously moving stock and power means normally disconnected from said mechanism, of release means between said mechanism and said power means and capable of connecting said power means to said mechanism, means, including an element movable independently of the moving stock, for operating said release means, separate mechanism for severing the stock into sections, power means operable independently of said first mentioned power means and normally disconnected from said severing mechanism, release means between said severing mechanism and said last mentioned power means and capable of connecting said power means to said severing mechanism, and means, including an element movable independ-

ently of the moving stock, for operating the last mentioned release means.

13. In apparatus of the class described, the combination with means for continuously feeding work, of mechanism for operating on the moving work, power means normally disconnected from said mechanism, a rotatable member provided with lugs, means for rotating said member, devices for connecting said power means to said mechanism, one of said devices being arranged to be successively engaged and actuated by said lugs, separate mechanism for severing the work during movement thereof, power means normally disconnected from said severing mechanism, a rotatable member provided with lugs, means for rotating the last mentioned member, and devices for connecting said last mentioned power means to said severing mechanism, one of said devices being arranged to be successively engaged and actuated by the lugs on the last mentioned rotatable member.

14. The herein disclosed process, employing a flying stamping element and a flying severing element, which process consists in supplying sheet material and continuously feeding it relative to the stamping and severing elements, then in intermittently operating the flying stamping element independently of the moving material to stamp therein openings spaced longitudinally of the sheet material, and finally intermittently operating the flying severing element independently of the moving material to sever the sheet material into sections.

15. In apparatus of the class described, the combination of mechanism including a work-performing element for operating on continuously moving stock and power means normally disconnected from said mechanism but arranged when released to impart a flying motion to said work-performing element, release means between said mechanism and said power means and capable of connecting said power means to said mechanism, and means, including an element movable independently of the moving stock for operating said release means.

16. In apparatus of the class described, the combination of mechanism including a work-performing element for operating on continuously moving stock and power means normally disconnected from said mechanism but arranged when released to impart a flying motion to said work-performing element, release means between said mechanism and said power means and capable of connecting said power means to said mechanism, means, including an operating element connected to said release means and an element movable independently of the moving stock arranged to engage and move said operating element, for operating said release means, and a device arranged in the path of movement of said operating element for disengaging it from said last mentioned element.

CARL M. YODER.

CERTIFICATE OF CORRECTION.

Patent No. 2,301,236.

November 10, 1942.

CARL M. YODER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 1, strike out "a" after "for"; line 6, for "the" before "descriptive" read --and--; page 7, second column, line 7, claim 2, before "connector" insert --a--; page 8, first column, line 4, claim 5, for "controlling" read --controlling--; line 31, claim 9, strike out the word "means"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of January, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)